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(54) Invert emulsion drilling fluid

(57) Invert emulsion drilling fluid comprising oil, emulsifier, and alcohol, the alcohol being at least about 30% by weight of the internal phase of the emulsion. The alcohol is preferably glycerol, isopropanol, ethylene glycol, 1, 2-propanediol, or polyglycerol.

pref. no water.

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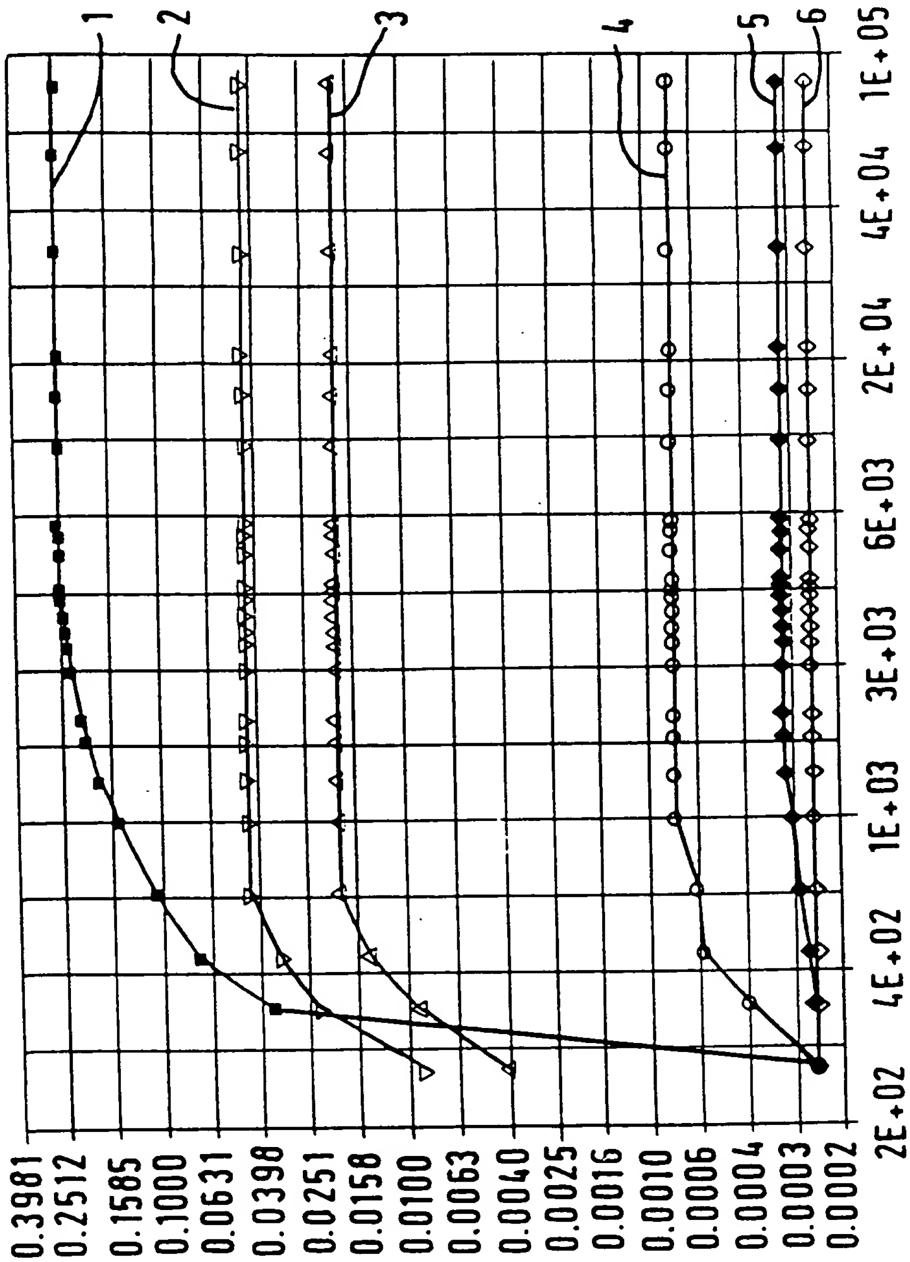
FIG.1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4E+02
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1
2
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4
5
6

FIG.2

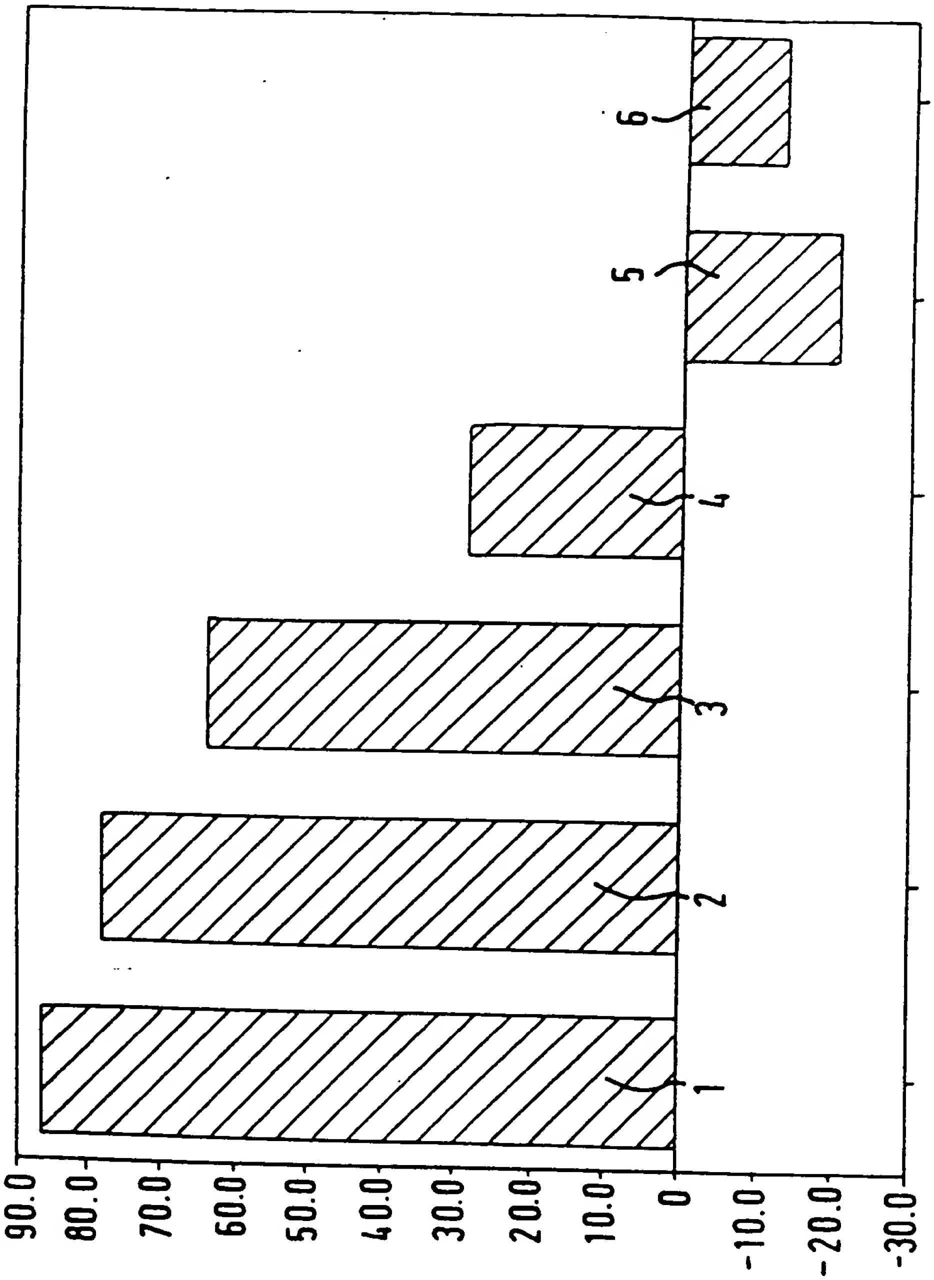
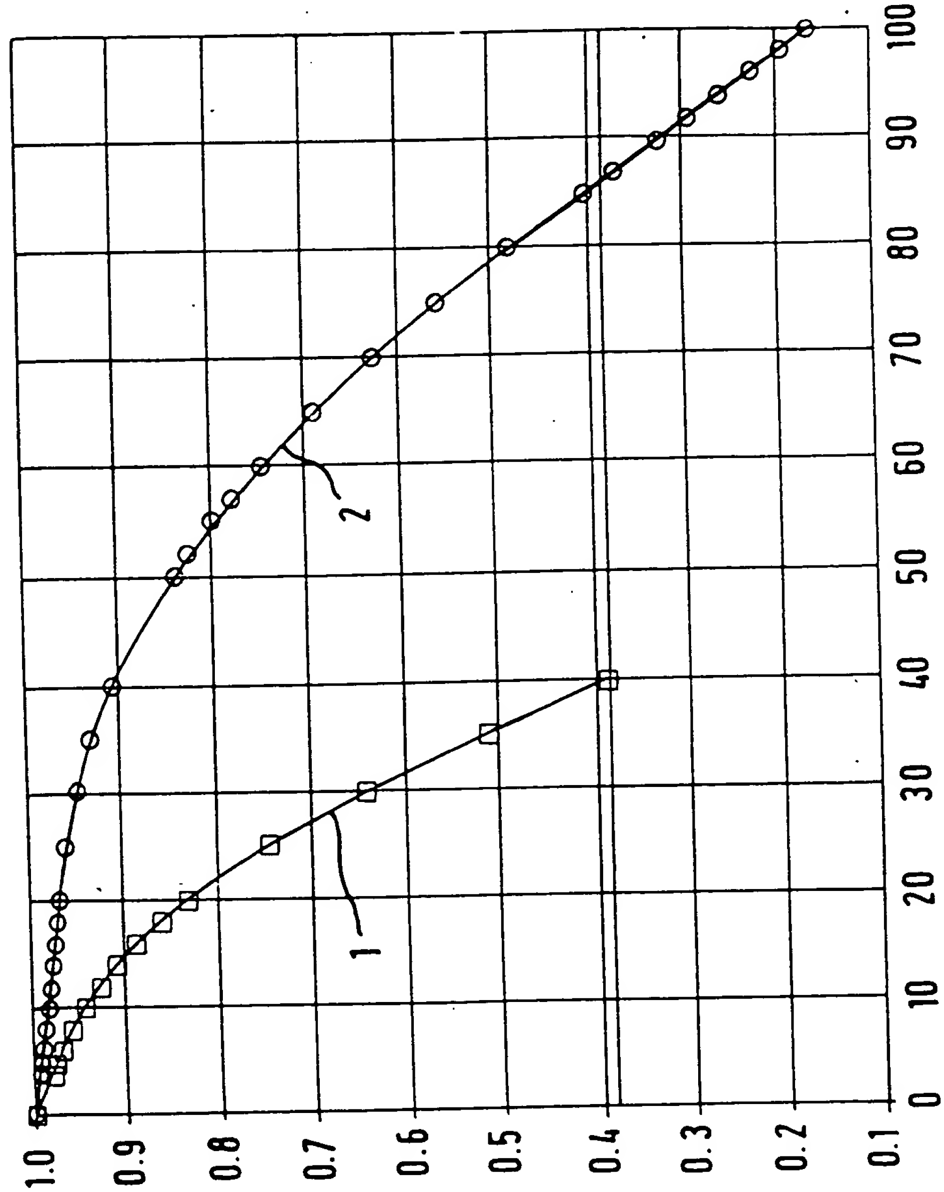


FIG. 3



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INVERT EMULSION DRILLING FLUID

This invention relates to an oil-based drilling fluid. More particularly, the invention relates to an invert emulsion drilling fluid having good rheological and fluid loss properties, while alleviating many of the problems associated with maintenance of the ionic strength of the internal water phase. Such an emulsion drilling fluid has a good temperature stability and the emulsion is stable under a variety of conditions (weight, temperature, presence of drill solids, formation water, etc.)

An oil-in-water emulsion drilling fluid (or mud) generally comprises water, oil, emulsifier, clays or polymers, and various treating agents which control the physical, chemical and/or rheological properties of drilling fluids in boreholes. Oil-in-water emulsion type drilling fluids have been used advantageously in the oil well drilling industry for many years. Emulsion drilling fluids possess many advantages over regular drilling fluids such as increasing drilling rates, longer bit lives, improved hole conditions, and the like. The most commonly used emulsion drilling fluids are oil-in-water types wherein oil is the dispersed phase and water the continuous phase.

Inverted or water-in-oil emulsions wherein oil is the continuous phase and water is the dispersed phase also have been used to advantage.

The selection of a drilling fluid is primarily dependent upon the geological formation being drilled and the problems associated with such formation. Principal concerns in the selection of a drilling fluid are temperature at drilling conditions, formation of gas hydrates, shale dispersion, borehole stability, drilling fluid loss and environmental requirements. The present invention provides a drilling fluid additive which overcomes these problems.

The primary purpose of the present invention is to provide an invert emulsion drilling fluid and a process for the use thereof,

which drilling fluid contains no water, or substantially no water, or less water than conventional oil based drilling fluid systems.

To this end the invert emulsion drilling fluid according to the present invention comprises oil, emulsifier, and alcohol, the alcohol being at least about 30 %w.

In the specification and in the claims "%w" is used to refer to per cent by weight based on the total weight of the internal phase of the emulsion, which is the internal phase of the drilling fluid.

The drilling fluid alleviates much of the borehole stability problem associated with interaction of water, which is the internal phase of an invert oil drilling fluid, with the clay matrix of the shales drilled. It will reduce shale dispersion and thus also improve borehole stability. The system is stable at high temperatures with good rheological and fluid loss properties. The drilling fluid of this invention also allows low temperature and high pressure drilling operations. It is a good system for inhibition of gas hydrates which form at low temperatures and high pressures.

In addition, the present invention is directed to a method for drilling a well comprising rotating a drill string to cut a borehole into the earth; and circulating an invert emulsion drilling fluid comprising oil, emulsifier and alcohol as the internal phase of the emulsion, through the drill string and through the annulus between the drill string and the wall of the borehole. Suitably, the drilling fluid contains no water, or substantially no water, or less water than conventional oil based drilling fluid systems.

The method also suitably includes monitoring the influx of formation water into the drilling fluid.

Other purposes, distinctions over the art, advantages and features of the invention will be apparent to one skilled in the art upon review of the following.

Applicant has discovered that the use of an alcohol such as glycerol as the internal phase of an invert emulsion drilling fluid presents certain advantages. Removal of all water from an oil-based

drilling fluid alleviates many of the borehole stability problems associated with the interaction of the water phase with the clay matrix of the shales drilled. The $CaCl_2$ in typical oil drilling fluid formulations is added for the purpose of obtaining what is referred to in the drilling fluid industry as "balanced activity" - that is, the water activity of the oil based drilling fluid is the same as that of the shale. The removal of water from the formulation reduces this problem since alcohol-like (particularly glycerol-like) molecules do not interact with the clay matrix in such a way as to cause swelling pressures of the magnitude observed with water. In addition, the activity range is much greater using alcohol than brines. This gives the drilling engineer greater flexibility in how the drilling fluid is formulated for a given type of shale. Frequently while drilling, water is encountered in the formations. The advantage of no water in the internal phase is that the ionic character of the water taken up by the system will be identical to that of the formation. Rheological and fluid loss properties of the alcohol based drilling fluid are essentially the same as those observed with a more typical oil based drilling fluid. Additives which are currently available in the industry are applicable in the new drilling fluid system of this invention.

Although the primary advantage of this invention is to have an oil-based drilling fluid without water, nothing precludes the addition of some water or the addition of a brine. If it is appropriate to increase the salt concentration, or to raise the water activity by simple dilution with water, this may be done easily without significant alterations to the drilling fluid properties. Clearly, the amount of water in the system would still be less than that used in a conventional oil-based drilling fluid system.

The ability to monitor the influx of formation water taken while drilling and to determine the composition and concentrations at the rig is a unique advantage that is essentially impossible on the rig with current technology. Even with sophisticated equipment in an analytical laboratory, the presence of a salt, e.g. NaCl or

$CaCl_2$. in the initial internal phase would provide a background that would make it difficult to identify those cations and anions specific to the water influx.

In most instances, the applicable amount of alcohol in the invert emulsion drilling fluid of the invention, optionally including water or brine, will be determined on a well-to-well basis. A concentration of alcohol in the emulsion of at least about 30, suitably at least about 50, more suitably at least about 90, or most suitably about 100 %w and, optionally, of brine or water of up to about 70, suitably up to about 50, more suitably up to about 10, and most suitably about 0 %w is suitable to achieve the objectives of the invention.

The various inorganic salts suitable for use with the invention, include but are not limited to NaCl, NaBr, KCl, $CaCl_2$ and $NaNO_3$, among which $CaCl_2$ is most suitable.

The use of salts of various kinds is done primarily for the purpose of borehole stability. A basic requirement for optimal conditions to drill shale is that the water phase in the oil drilling fluid must be in osmotic balance with the shale. Thus, for a hard dry shale, typically high salt concentrations are required to prevent the swelling pressures in the borehole from increasing due to hydration.

The alcohol of the present invention is suitably any alcohol of less than 8 hydroxy groups and less than 16 carbon atoms. Glycerol is most suitable. Other suitable exemplary alcohols include isopropanol, ethylene glycol, 1,2-propanediol, and polyglycerol.

The advantage of using alcohols in the internal phase is that much of the concern for the ionic character of the internal phase is no longer required. If no water is present in the system, the hydration of the shales is greatly reduced. That is not to say that the alcohols do not interact with the clays of the shale. It is known that alcohols such as ethylene glycol can interact with the clay lattice and cause a separation of the clay platelets. However, as shown herein (see example 3), the amount of swelling observed is

significantly less than that observed for water (typically less than 1%).

The emulsifiers used in this invention are the same ones typically used in water-in-oil drilling fluids. These include the various fatty acid soaps, suitably the calcium soaps, polyamides, and mixtures. These soaps are formed while mixing the water and oil phase together in conjunction with lime which is the primary source of calcium. Suitable alcohols are of sufficient polarity that emulsification is possible. Such emulsifiers are listed in the following patents: USA Patent Nos. 281 042; 2 876 197; 2 994 660; 299 063; 2 962 881; 2 816 073; 2 793 996; 2 588 808; and 3 244 638.

A variety of weighting agents can be used in the present invention as well as in the typical water-in-oil emulsions. These are barite, galena, ilmenite, iron oxides, siderite, calcite, and the like.

Any of the typically used suspending agents known to the industry can be used. A very suitable suspending agent is an organophilic clay (organoclay). The descriptions of these agents can be found in the following references: USA patent Nos. 2 531 427; 2 966 506; 4 105 578; and 4 208 218.

The present invention is drawn to using alcohols at high concentrations (as much as 100 %w). Thus, most, if not all, of the water is removed from the system, and if formation water is taken in, then it is of the same ionic composition as that of the formation water. The present invention relates to the fact that no water is the present in the most suitable state - especially in hard dry reactive shale formations. Even in soft, wet shales the addition of alcohol at relatively high concentrations reduces the amount of water available.

The following examples are illustrative of the application of the process of the present invention and of the drilling fluid composition, and are not to be construed as limiting the scope thereof.

In all the examples viscosity and rheology measurements were made using a FANN 35A at 150 °F. High Pressure High Temperature (HPHT) was performed as described in API 13B entitled Standard Procedure for Field Testing Drilling Fluids. Mineral Oil (ODC) is a product of Vista Chemical Company. VersaMul, VersaLig, VersaWet, VersaTrol HT and Ken Cal Lare all trade names for products sold by M.I. Drilling Fluids, a Halliburton-Dresser Company.

In Examples 1, 2, and 3, mixing was done using a Multimixer in which the diesel, or mineral oil, glycerol with emulsifiers, and lime was mixed for 30 minutes. To this emulsion the fluid loss reducing agents were added followed by the organophilic clay. This mixture was blended for another 30 minutes. To this mixture, the weight material, if appropriate, was added. The samples were then hot rolled at the temperature indicated for 16 hours.

Example 1 demonstrates data in which glycerol was mixed with diesel or mineral oil with weight material to obtain different densities. The results shown in Table 1 indicate that a glycerol internal phase can be emulsified into oil-based drilling fluid that is stable with temperature. The rheological and fluid loss properties are well within the requirements typically assigned to oil-based drilling fluids.

In Examples 2 and 3 similar experiments are shown for incorporation of polyglycerol (Example 2, see Table 2) and 1,2 propanediol (Example 3, see Table 3) into an oil-based drilling fluid. Reasonable properties in terms of rheology and fluid loss control are observed. The results clearly indicate that a viable drilling fluid system can be used with an alcohol being used as the internal phase.

Reference is now made to the accompanying drawings, wherein

Figure 1 illustrates swelling in inches of Pierre shale (on the vertical axis) as a function of time in seconds (on the horizontal axis);

Figure 2 shows change in water content (in per cent on the vertical axis) of a shale as a function of the fluid with which the shale is brought into contact; and

Figure 3 shows the activity of water (on the vertical axis) in a shale in contact with a fluid as a function of the solute in the fluid in %w (on the vertical axis).

In Example 4 (Figure 1), the shale was ground to a 200 mesh size. The shale was then reconstituted at 5 000 psi for 2 hours. The reconstituted wafer was then incubated, as a function of time, with the test fluids. Swelling was monitored with the use of a linear variable transducer which was interfaced to a HP3497A Acquisition/Control Unit. The data are expressed in inches.

The swelling experiment of Example 4 was done to demonstrate the relative impact on swelling of an invert fluid-in-oil emulsion wherein the fluid is fresh water (curve 1), 25 %w $CaCl_2$ (curve 2), 35 %w $CaCl_2$ (curve 3), 100 %w glycerol (curve 4), or, according to the invention, glycerol (curve 5). Curve 6 represents diesel oil. The results clearly indicate that glycerol has a reduced tendency relative to fresh water, or the $CaCl_2$ brines, to cause swelling. This has the advantage that the swelling pressures induced by introduction of the drilling fluid to the formation should be less if an alcohol is in the internal phase of the oil drilling fluid than if a brine is in the internal phase.

In Example 5 (Figure 2) approximately 5 gm (gram) shale (Garza shale which is a hard dry shale obtained from 13 750 ft in South Texas) was incorporated into dialysis tubing. The shale wrapped in dialysis tubing was placed in different fluids. The compositions of the drilling fluids are given in Table 4, the drilling fluids were hot rolled at 150 °F for 16 hour. The shale wrapped in dialysis tubing was hot rolled at 150 °F for one week. At the end of that week the shale was removed from the dialysis tubing, weighed again, and then dried at 105 °C for 24 hours. The dried shale was weighed and the amount of water in the shale calculated. The native shale had a water content of 2.3 per cent. The data are expressed as a per cent of the native when shale is brought in contact with an invert fluid-in-oil emulsion wherein the fluid is fresh water (block 1), 5 %w $CaCl_2$ (block 2), 10 %w $CaCl_2$ (block 3), 20 %w $CaCl_2$

(block 4), 30 %w $CaCl_2$ (block 5), or, according to the invention, glycerol (block 6).

From Figure 2 it can be concluded that low $CaCl_2$ internal phases resulted in the increase in water content. Only at the 30 %w $CaCl_2$ concentration was the water content approximately that of the native. In fact, it was slightly less. Hot rolling the shale in a glycerol-in-oil drilling fluid resulted in slightly less water content than the native. The results indicate that, depending upon the $CaCl_2$ concentration, significant variation in the water content of the shale can occur.

The influx of water into the formation could cause significant increase in swelling pressure and thus borehole failure. Alcohols or $CaCl_2$ in water are freezing point depressants. They furthermore reduce the activity of water in the shale, and dependent upon the osmotic character of the shale, this can be used in oil-based drilling fluids to offset the influx of water from the oil-based drilling fluid into the shale. In general the swelling pressure of shale and consequently the chance of borehole-collapse increase with the activity of water in the shale.

In Example 6 (Figure 3), the activities of $CaCl_2$ in water solutions (curve 1) or glycerol in water solutions (curve 2) are shown. The activity of each solution in the shale was determined with a Digital Thermo-Hygrometer Model 880 (General Eastern). The results indicate that a solution of glycerol in water has a large range of activities that can be used in an oil-based drilling fluid to adjust the osmotic character of the drilling fluid if necessary. The glycerol-in-oil drilling fluid offers an increased range from 0.388 to 0.18. In addition, if higher activities are required, then a simple dilution of the alcohol with water or brine can be used. As can be seen for shales that may require an activity below 0.388, $CaCl_2$ cannot be used.

The amount of water in the solutions in %w is 100 %w minus the amount of solute on the horizontal axis of Figure 3. Thus it can be seen that for a shale in which the water activity is relatively high (0.5 to 0.9), the amount of water available for interaction

with the shales is less if glycerol is used in the internal phase relative to $CaCl_2$. This is a unique advantage of this invention. If formation fluids are contacted while drilling, these fluids should combine with the alcohol phase to render a fluid that has a similar ionic composition as the formation. In addition, the change in activity of the internal phase should be less in the alcohol-in-oil drilling fluid than the brine-in-oil drilling fluid. Two observations are consistent with this statement: (1) the slope of the exponential curve for $CaCl_2$ is rather sharp in the range of $CaCl_2$ typically used (25-35 %w). A relatively small influx in water from the formation will cause a dramatic increase in activity. This can be concluded since the majority of formation brines are predominantly NaCl which at saturation has an activity of 0.755; (2) with glycerol the slope is more shallow and an influx of brine results in a smaller change in activity.

For hard dry shales that are reactive to water, 100 %w glycerol has an activity coefficient that is sufficiently low that this provides a unique character to the glycerol-in-oil drilling fluid system. The low water activity is such that the possibility of increased swelling pressures due to the presence of drilling fluid is greatly reduced - thus better borehole stability. The alcohol-in-water drilling fluid provides a wider range of water activities and thus greater flexibility.

Alcohols can be used as temperature stabilizers, however, in compositions which are restricted to 0-10 lb/bbl. The compositions envisioned by the present invention as necessary require effectively up to 100 %w, with a range between 20 lb/bbl and 100 lb/bbl depending upon the activity of the fluid desired. In the present patent application, reference is taken to amounts which are typically greater than about 30 %w and most likely are in the 50-100 %w of alcohol.

Table 1. Results of glycerol-in-oil emulsion drilling fluids (Example 1).

	Run 1		Run 2	Run 3	
Mineral Oil (ODC) (ml)	-	-	-	-	
Diesel (ml)	178	178	178	213	213
VersaMul (ml)	5.0	5.0	5.0	4.5	4.5
VersaWet (ml)	1.0	1.0	1.0	1.0	1.0
VersaTrol HT (gm)	3.5	3.5	3.5	3.0	3.0
VersaLig (gm)	3.0	3.0	7.0	3.0	3.0
Glycerol (ml)	18.6	18.6	18.6	16.0	16.0
Organophilic clay (gm)	2.4	2.4	2.4	2.0	2.0
Barite (gm)	589	589	589	460	460
Lime (gm)	3.5	3.5	3.5	3.1	3.1
Density	18.5	18.5	18.5	16.2	16.2
Hot Roll Temp.(°F)	150	300	400	150	300
Plastic Viscosities (cps)	69	87	95	43	59
Yield Point (lb/100 ft^2)	22	6	5	14	15
10 second (lb/100 ft^2)	19	7	6	9	6
10 minute (lb/100 ft^2)	28	22	23	14	15
Density (lb/gal)	18.5	18.5	18.5	16.2	16.2
HPHT 30 min. 325 °F (ml)	7.9	3.5	5.5	9.2	8.5

(Table 1 - Continued)

(Continued from Page 10)

	Run 4		Run 5	
Mineral Oil (ODC)(ml)	-	-	-	-
Diesel (ml)	235	235	257	257
VersaMul (ml)	5.0	5.0	4.5	4.5
VersaWet (ml)	1.2	1.2	1.0	1.0
VersaTrol HT (gm)	3.4	3.4	3.0	3.0
VersaLig (gm)	3.4	3.4	3.0	3.0
Glycerol (ml)	18.0	18.0	16.0	16.0
Organophilic clay (gm)	2.3	2.3	2.0	2.0
Barite (gm)	35.5	35.5	278	278
Lime (gm)	3.4	3.4	3.0	3.0
Density	14	14	12.5	12.5
Hot Roll Temp.(°F)	150	300	150	300
Plastic Viscosities (cps)	26	30	20	24
Yield Point (lb/100 ft^2)	10	13	4	5
10 second (lb/100 ft^2)	7	9	3	3
10 minute (lb/100 ft^2)	12	13	4	9
Density (lb/gal)	14	14	12.5	12.5
HPHT 30 min. 325 °F (ml)	8.3	7.5	5.5	4.5

(Table 1 - Continued)

(Continued from Page 11)

	Run 6	Run 7		Run 8
Mineral Oil (ODC) (ml)	-	-	-	-
Diesel (ml)	265	178	178	178
VersaMul (ml)	14.0	5.2	5.2	5.2
VersaWet (ml)	3.3	1.2	1.2	1.2
VersaTrol HT (gm)	9.6	3.5	3.5	3.5
VersaLig (gm)	4.8	3.0	3.0	7.0
Glycerol (ml)	50.5	18.6	18.6	18.6
Organophilic clay (gm)	4.8	2.4	2.4	2.4
Barite (gm)	-	589	589	589
Lime (gm)	9.6	3.5	3.5	3.5
Density	7.8	18.5	18.5	18.5
Hot Roll Temp.(°F)	150	150	300	400
Plastic Viscosities (cps)	9	64	70	80
Yield Point (lb/100 ft^2)	1	2	5	5
10 second (lb/100 ft^2)	1	4	5	6
10 minute (lb/100 ft^2)	2	9	8	9
Density (lb/gal)	7.8	18.5	18.5	18.5
HPHT 30 min. 325 °F (ml)	3	2	3.5	14.5

Table 2. Results of polyglycerol-in-oil emulsion drilling fluids (Example 2).

	Run 1		Run 2
Mineral Oil (ODC) (ml)	-	-	-
Diesel (ml)	178	178	178
VersaMul (ml)	5.2	5.2	5.2
VersaWet (ml)	1.2	1.2	1.2
VersaTrol HT (gm)	3.5	3.5	3.5
VersaLig (gm)	3.0	3.0	7.0
Polyglycerol (ml)	18.6	18.6	18.6
Organophilic clay (gm)	2.4	2.4	2.4
Barite (gm)	589	589	589
Lime (gm)	3.5	3.5	3.5
Density	18.5	18.5	16.2
Hot Roll Temp.(°F)	150	300	400
Plastic Viscosities (cps)	70	89	95
Yield Point (lb/100 ft^2)	22	3	7
10 second (lb/100 ft^2)	20	8	8
10 minute (lb/100 ft^2)	27	23	22
Density (lb/gal)	18.5	18.5	18.5
HPHT 30 min. 325 °F (ml)	9.2	4.8	6.9

(Table 2 - Continued)

(Continued from Page 13)

	Run 3	
Mineral Oil (ODC) (ml)	-	-
Diesel (ml)	235	235
VersaMul (ml)	5.0	5.0
VersaWet (ml)	1.2	1.2
VersaTrol HT (gm)	3.4	3.4
VersaLig (gm)	3.0	3.0
Polyglycerol (ml)	17.8	17.8
Organophilic clay (gm)	2.3	2.3
Barite (gm)	355	355
Lime (gm)	3.4	3.4
Density	14	14
Hot Roll Temp.(°F)	150	300
Plastic Viscosities (cps)	27	33
Yield Point (lb/100 ft^2)	10	9
10 second (lb/100 ft^2)	8	8
10 minute (lb/100 ft^2)	13	12
Density (lb/gal)	14	14
HPHT 30 min. 325 °F (ml)	9.1	7.2

(Table 2 - Continued)

(Continued from Page 14)

	Run 4		Run 5
Mineral Oil (ODC) (ml)	-	-	178
Diesel (ml)	-	-	-
VersaMul (ml)	5.2	5.2	5.2
VersaWet (ml)	1.2	1.2	1.2
VersaTrol HT (gm)	3.5	3.5	3.5
VersaLig (gm)	3.0	3.0	7.0
Polyglycerol (ml)	18.6	18.6	18.6
Organophilic clay (gm)	2.4	2.4	2.4
Barite (gm)	589	589	589
Lime (gm)	3.5	3.5	3.5
Density	18.5	18.5	18.5
Hot Roll Temp.(°F)	150	300	400
Plastic Viscosities (cps)	64	69	83
Yield Point (lb/100 ft^2)	0	6	8
10 second (lb/100 ft^2)	4	6	7
10 minute (lb/100 ft^2)	11	8	11
Density (lb/gal)	18.5	18.5	18.5
HPHT 30 min. 325 °F (ml)	5.3	4.6	5.1

Table 3. Results of 1,2 propanediol-in-oil emulsion drilling fluids (Example 3).

	Run 1	
Mineral Oil (ODC) (ml)	-	-
Diesel (ml)	178	178
VersaMul (ml)	5.2	5.2
VersaWet (ml)	1.2	1.2
VersaTrol HT (gm)	3.5	3.5
VersaLig (gm)	3.0	3.0
1,2 Propanediol (ml)	18.6	18.6
Organophilic clay (gm)	2.4	2.4
Barite (gm)	594	594
Lime (gm)	3.5	3.5
Density	18.1	18.1
Hot Roll Temp.(°F)	150	300
600 RPM	155	178
300 RPM	82	92
Plastic Viscosities (cps)	73	86
Yield Point (lb/100 ft^2)	9	6
10 second (lb/100 ft^2)	11	7
10 minute (lb/100 ft^2)	24	22
Density (lb/gal)	18.5	18.5
HPHT 30 min. 325 °F (ml)	11.2	8.8

(Table 3 - Continued)

(Continued from Page 16)

	Run 2	
Mineral Oil (ODC) (ml)	-	-
Diesel (ml)	235	235
VersaMul (ml)	5.0	5.0
VersaWet (ml)	1.2	1.2
VersaTrol HT (gm)	3.4	3.4
VersaLig (gm)	3.0	3.0
1,2 Propanediol (ml)	17.8	17.8
Organophilic clay (gm)	2.3	2.3
Barite (gm)	355	355
Lime (gm)	3.4	3.4
Density	13.8	13.8
Hot Roll Temp.(°F)	150	300
600 RPM	67	76
300 RPM	39	44
Plastic Viscosities (cps)	28	32
Yield Point (lb/100 ft^2)	11	12
10 second (lb/100 ft^2)	8	8
10 minute (lb/100 ft^2)	13	12
Density (lb/gal)	14	14
HPHT 30 min. 325 °F (ml)	8.4	8

Table 4. Composition of drilling fluids in example 5.

$CaCl_2$	%	0.0	5.0	10.0	20.0	30.0	-
Diesel	(ml)	203.8	204.2	204.6	205.6	206.4	193.6
VersaMul	(ml)	9.0	9.0	9.0	9.0	9.0	9.0
Lime	(gm)	10.0	10.0	10.0	10.0	10.0	10.0
Brine	(ml)	36.0	36.0	36.1	36.3	36.6	0.0
Ken Cal L	(ml)	2.0	2.0	2.0	2.0	2.0	2.0
VersaTrol	(gm)	10.0	10.0	10.0	10.0	10.0	10.0
Barite	(gm)	462.9	461.0	459.0	454.7	449.9	446.9
Glycerol	(gm)	-	-	-	-	-	34.1

C L A I M S

1. Invert emulsion drilling fluid comprising oil, emulsifier, and alcohol, the alcohol being at least about 30 %w.

2. Invert emulsion drilling fluid as claimed in claim 1 wherein the alcohol has less than 8 hydroxy groups and less than 16 carbon atoms.

3. The drilling fluid as claimed in claim 1 wherein the alcohol is at least about 90 %w.

4. Invert emulsion drilling fluid as claimed in claim 1 wherein the alcohol is water free.

5. Invert emulsion drilling fluid as claimed in claim 1 wherein the alcohol is glycerol.

6. Invert emulsion drilling fluid as claimed in claim 1 wherein the alcohol is isopropanol.

7. Invert emulsion drilling fluid as claimed in claim 1 wherein the alcohol is ethylene glycol.

8. Invert emulsion drilling fluid as claimed in claim 1 wherein the alcohol is 1,2-propanediol.

9. Invert emulsion drilling fluid as claimed in claim 1 wherein the alcohol is polyglycerol.

10. Invert emulsion drilling fluid as claimed in claim 1 including up to about 70 %w water.

11. Invert emulsion drilling fluid as claimed in claim 1 including up to about 70 %w brine.

12. Invert emulsion drilling fluid as claimed in claim 11 wherein the brine is NaCl brine.

13. Invert emulsion drilling fluid as claimed in claim 11 wherein the brine is $CaCl_2$ brine.

14. Method for drilling a well, comprising:

rotating a drill string to cut a borehole into the earth; and

circulating an emulsion drilling fluid, said drilling fluid comprising oil, emulsifier and alcohol, with the alcohol being at

least about 30 %w, through the drill string and through the annulus between the drill string and the wall of the borehole.

15. Method as claimed in claim 14 including monitoring the influx of formation water into the drilling fluid.

18. Invert emulsion drilling fluid as claimed in claim 1 substantially as described in the specification with reference to the examples.

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